Original Article

Physiotherapy and Occupational Therapy Journal
Volume 9 Number 2, April - June 2016
DOI: http://dx.doi.org/10.21088/potj.0974.5777.9216.2

To Evaluate the Efficacy of Dual Task on Gait Parameter in Geriateric Population

Sanjai Kumar*, Meenu Singh, Manish Arora*****

Abstract

Objectives: To evaluate the effects of secondary task (motor/cognitive) on selected spatial and temporal gait parameters in geriatric population? The objective of the study is to describe the effects of motor and cognitive secondary tasks on selected spatial and temporal gait parameters in elderly population. *Subjects:* Fifty (N=50) older subjects (24 women and 26 men), 65-75 years, who meet the inclusion and exclusion criteria were recruited in the study. *Design:* An experimental design study. All tests of all subjects were conducted in the physiotherapy O.P.D. of CSS Hospital, at JAI PHYSIOTHERAPY AND DENTAL CLINIC, SF-06, ANSAL GALLERIA, ANSAL TOWN, MEERUT and in the Physiotherapy OPD of S.B.S. Post Graduate Institute of Bio-Medical Sciences & Research, Balawala, Dehradun. Prior to testing, all the subjects were interviewed about their medical history and had explained the research procedure to them. This information was used to characterize the demographics and health status of subjects participating in the study. Cognition was evaluated by the score of Mini Mental Scale and the balance was evaluated by the Berg's Balance Scale. The participants were asked to perform, in randomized order, the following tasks. Walking alone at their usual speed over a distance of 10 meters and performing a cognitive task, such as loud backword counting from fifty (arithmetic task), and performing a motor task of carrying a plate with full glass of water while walking. Under the dual task condition subjects were not given instruction on speed, to avoid biasing either speed of walk or cognitive response. Before testing, standardized verbal instructions regarding the test procedure with visual demonstration of the walking test was given. Since we were not interested in the potential efforts of the cognitive task on changes in gait dynamics and gait instability and were not necessarily concerned with subjects performance on the cognitive task itself, we did not evaluate performance on the cognitive task.

Each subject completed one trial for all of the testing conditions. The walking trials were realized on a 10 meter walkway in a well lit environment at a self selected speed and wearing their own foot wear. The walkway 9 x 0.5 meter was marked on the floor with two sidelines and the subject was told not to step outside these lines while walking. The subject was followed by a spotter in case of falling. Each walking trial was recorded with a video camera placed on a tripod in front of the walkway; number of steps, number of lateral stepping over and stops were counted and noted from the recording. Time required to complete the 9 meter course was recorded in seconds using a digital stop watch. Participants were given standard instruction to start walking after hearing "Start" and to keep walking until asked to stop. Both the acceleration and deceleration phase of gait were included for analysis. Average gait speed [velocity] was calculated and expressed in centimeter/seconds, the average cadence in number of steps/minute. The lateral stepping out and stops were counted and expressed in percentage. *Data Analysis*: All analysis were obtained using SPSS windows. Demographic data of subjects including age, Berg's Balance Scale and Mini Mental Scale were descriptively summarized. The dependent variables for statistical analysis were gait cadence, gait velocity, lateral stepping out and stops. One way Multivariate analysis of Variance with repeated measures was performed, to analyze the differences in the gait performances among the three conditions: walking with no task, walking with motor task and walking with cognitive task readings. An α level of 0.05 was used to determine statistical significance. Follow up analysis of variance were conducted if the test demonstrated statistical significance. All possible pair wise post hoc analysis was conducted on the significant dependent variable

Author Affiliation: *Associate Professor, Subharti College of Physiotherapy, Meerut. **Senior Consultant, Jai Physiotherapy and Dental Clinic, SF-06, Ansal Galleria, Ansal Town, Meerut. ***Professor & HOD, S.B.S. Post Graduate Institute of Bio-Medical Sciences & Research, Balawala, Dehradun.

Reprint Request: Sanjai Kumar, Associate Professor, Subharti College of Physiotherapy, N.H.-58, Meerut Haridwar Bye Pass, Meerut, Uttar Pradesh 250005, India.
E-mail: kumarsanjai40@yahoo.com

in order to compare difference between conditions. To prevent an inflation of type one error or to maintain á at p=0.05 for this follow up test; a Bonferroni corrected post hoc test was used. *Results:* The results of my study showed that there is a reduction in walking speed for the cognitive performance in Geriatric subjects. *Conclusion:* The results of the study show that elderly subjects attend to do a complex secondary task at the same time as walking, there is a significant dual task interference that compromises the cadence, speed of walking, lateral stepping out and stops. Cognitively demanding activity during walking appears to increase the gait interference more and therefore the type of secondary task was a major determinant of the severity of dual task interference. Performance changes in gait and secondary task when performed simultaneously, confirms that walking is an attention demanding task in elderly population. The results of my study supports the hypothesis, within the limitation of this study. The result of this study provides a base for further research as they presents valuable outcomes for practitioners treating the geriatric population for cognitively demanding activity during gait training.

Keywords: CAD(Cadence); VEL(Velocity); LSO(Lateral Stepping Out) and STP(Stops).

Introduction

The proportion of the population that consists of elderly people is increasing in western as well as in many countries. The individuals 65 years of age and over currently compose 12% of the total US population. This proportion is expected to rise upto 20% by the year 2040. This rapid growth of elderly population has led to an increase in the number older people who experience functional disability. Estimates are that 17% of non institutionalized individuals over the age of 65 years experience some difficulty in performance of basic activities of daily living and instrumental activities of daily living. The likelihood of having difficulty with activities of daily living and instrumental activities of daily living increases as an individual age. 12% of population, 65 to 74 years of age experience difficulty with both activities of daily living and instrumental activities of daily living. This incidence rises to 22% in the 75–84 years old age group and to 4% in those individuals 85 years of age and over [1].

Dual tasking that is engaging in two activities at the same time is common in daily living. During many activities of daily living, people need to perform more than one task at a time. The complexity to do a secondary task(dual task performance) is highly advantageous during walking, because it allows for communication between people, transportation of objects from one location to another and monitoring of environment so that threats to balance can be avoided [2].

Changes of gait characteristics because of a simultaneously performed attention demanding task have been reported frequently among older population. Because of the high prevalence of vision and hearing impairments in older adults, however the association of walking with simultaneous cognitive tasks such as mental arithmetic and motor task such as carrying tray with a glass of water seems to be a more appropriate approach for testing dual task related gait performance of the elderly population [3].

Gait instability is characterized by increased variability from one stride to the next and is common in many older adults; even in absence of pathology. In individuals with neurological pathology, deficits in CNS's ability to coordinate motor outputs are largely responsible for gait instability. In older individuals without apparent neurological pathology, it is not entirely clear why gait instability occurs. Regardless of the cause, gait instability can be quantified [4].

The study of attention or attentional capacity has been a focus of the psychological literature for sometime. One method that has been used to determine the attentional demands of a particular task is called the dual task paradigm. As little, if any, evidence is available with the request to the attentional demand of tasks or procedures used in the clinics, it can be assumed that this methodology has yet to be used in the rehabilitation setting. The dual task methodology requires an individual to perform a task that is being evaluated in terms of its attentional demand (primary task), while simultaneously performing an alternative task (commonly termed as secondary probe task) [5].

Normal aging is characterized by functional changes in the sensory, neurological and musculoskeletal systems. These changes affects several motor tasks. With respect to gait, reduced velocity, shorter steps and slower cadence with advancing age have been reported in healthy elderly [6].

The involvement of attention in the control of the walking – related rhythmic steeping mechanism remains less clear, with only a few and contradictory published results in the literature [7]. Optimal training strategies for dual task performance, in general, and concurrent motor and cognitive tasks, in particular have yet to be determined. No study has been done on secondary motor task interfering gait in healthy elderly, but neurological conditions (Parkinson's disease). Weather secondary motor tasks lead to greater deterioration in gait than secondary cognitive tasks of similar complexity has not been investigated. The literature contains no reports where motor and cognitive secondary tasks were studied within the same investigate.

Aims and Objectives

To evaluate whether the secondary task (motor/ cognitive) on selected spatial and temporal gait parameters would have an effect in geriatric population? The objective of the study is to describe the effects of motor and cognitive secondary tasks on selected spatial and temporal gait parameters in geriatric population.

Operational Defination

Definition of the "Elderly":- The first gerentologic question is, how does a particular segment of population came to be categorized as "Old"? The chronological criterion that is presently used for identifying the old in America is strictly arbitrary and usually has set at 65 years. Because women usually live longer than men, the problems of America's elders are largely the problems of women. The results of several national survey indicate that many of elderly (ranging from 37 to 58%) reports limited or complete inability to carry out activities of daily living. The majority of elderly are women [8].

Gait in the Elderly

A number of investigations have been made of the changes in gait which occur with advancing age. The description which follows is confined to the effects of age on free speed walking although also examined the fast walking [9].

The gait of elderly is subject to two influences – the effects of age itself and the effects of pathological conditions, such as osteoarthritis and parkinsonism, which become more common with advancing age. Providing patients with pathological conditions are carefully excluded, the gait of the elderly appears to be simply a slowed-down version of the gait of younger adults. The author were carefully to point out that 'the walking performance of older men did not resemble a pathological gait' [10].

Dual task paradigm:- The term dual task interference refers to the decrement in performance of one or both tasks when two activities are carried out concurrently. From a widely view point, the degree of dual task interference is a measure of attentional requirements of the component tasks. Extensive evidence documents the decline of performance on one or both activities with engagement in concurrent cognitive and motor tasks. In view of that evidence and the commonness of dual tasking in daily living, procedures to assess and improve dual task performance should be incorporated in fall prevention and rehabilitation programs. Dual task interference occurs when the attentional demands of the two concurrently performed tasks exceed the available capacity. The attentional requirement of performing two tasks simultaneously is the sum of the attentional needs of the component tasks. From that perspective, training aimed at improving dual task performance should include practice in dual tasking. Declines in multiple task performance with age are caused by declines in task coordination [11].

Models of Dual Task Interference

The main theoretical models accounting for dual task interference are :- postponement models, cross talk models, single channel{Bottleneck} theory and capacity/resource sharing model.

Postponement Models:- It proposes that specific cognitive operation can only occurs when a single mechanism is exclusively dedicated to performing that operation for a sufficient period of time.

Cross Talk Models:- According to this theory the task similarity is key factor in successful dual task performance. Similar tasks share the some motor control processing mechanisms and therefore fewer resources are used during simultaneous performance of similar tasks. Cross talk models assume task similarity reduces the dual task interference, because the use of the same pathway increases the efficiency of processing by using less attentional resource capacity.

Single Channel{Bottleneck} theory:- According to this theory of attention, the execution of motor skills involves a mechanism that has limited capacity to process concurrent tasks. The base construct is that tasks are processed in series rather than the parallel. Therefore when a person attempts to consciously control a movement at the same time, the execution of one is compromised. The bottleneck and cross talk models assume that dual task interference is affected by the type of tasks performed simultaneously, rather than the amount of attention needed to sustain performance, when the critical mechanism is occupied with one task, processing operations in the other task that require the mechanism must be postponed until the mechanism becomes available; hence the concept of a processing "bottleneck" or "single channel".

Capacity/Resource Sharing Model:- According to this theory, a central mechanism exists that allocates appropriate attention resources to the performance of the tasks. The major alternative class of models is capacity or resource theories. Finite resources are available; consequently when a demanding primary task is performed like maintaining posture, the secondary task slows, ceases or is performed with greater errors. The allocation of resources change continually according to the resources needed by a given task at a particular time and is graded according to the difficulty of the task. This model allows for the concept of parallel processing. Capacity sharing models are based on the assumption that attention resources are limited.

Hypothesis: Experimental Hypothesis

1. Performing a motor task during alter the temporal and distance parameters of gait in elderly population.
2. Performing a cognitive task during the gait alter the temporal and distance parameters of gait in elderly population.

Null Hypothesis

1. Performing a motor task during does not alter the temporal and distance parameters of gait in elderly population.
2. Performing a cognitive task during the gait does not alter the temporal and distance parameters of gait in elderly population.

Variables

Dependent Variables

1. Cadence (steps/min)
2. Velocity (cm/sec)
3. Lateral Stepping out
4. Frequency In Percentage of Stops

Independent Variables

1. Dual Task
2. Secondary Motor Task
3. Secondary Cognitive Task

Limitation of Study

The small sample size was one of the major limitations of the study. This study has several limitations. The experimental procedure was limited to one cognitive task, counting back the numbers from 100 and one motor task of carrying plate. The generalizability of the present findings to performance of different cognitive and motor tasks is unknown. Investigation of the effects of functional task during gait in more real-world settings during activities of daily living is needed. The data has been restricted to institutionalized older subjects. To fully understand the effect of secondary task performance on gait in geriatric subjects, the effects of various types of skilled, unskilled, complex and simple tasks need to be evaluated. Also, most the participants belonged to the same community. Thus, results obtained cannot be generalized for all geriatric population.

Inclusion Criteria

- Age – 65-75 years.
- Sex – Both males and females.
- Elderly ambulant people without aids.
- Able to understand and follow commands.
- Mini Mental Score – 22 to 30.
- Berg's Balance Scale – 41 to 56.

Exclusion Criteria

- No history of falling.
- No acute medical illness.
- No neurological diagnosis such as Parkinson's disease, stroke, severe dementia, cerebellar disease, myelopathy, myopathy or peripheral neuropathy.
- No psychiatric disorders.
- No major orthopaedic diagnosis including lower back, pelvis or lower extremities and do not use walking aids.

Design

An experimental design study having same subject design undergoing 3 different conditions. The outcom Pre-test and post-test match subject design.

Instruments and Special Testing Tools

The method required very little equipments which includes-

- Digital stop watch
- A measuring tape
- Video Camera
- Chalks to draw the walkway on the floor
- Plate and Glass filled with full water

Materials

Protocol

A sample of (N=50) volunteer participants (N=21), both male and female, age between 65 to 75, were recruited for study. All tests of subjects were conducted in the physiotherapy O.P.D. of CSS Hospital, at Jai Physiotherapy and Dental Clinic, SF-06, Ansal Galleria, Ansal Town, Meerut, and Physiotherapy O.P.D. of S.B.S. Post Graduate Institute of Bio-Medical Sciences & Research, Balawala, Dehradun. Prior to testing, all the subjects were interviewed about their medical history and had explained the research procedure to them. This information was used to characterize the demographics and health status of subjects participating in the study. Cognition was evaluated by the score of Mini Mental Scale and the balance by the Berg's Balance Scale was completed.

The participants were asked to perform, in randomized order the following tasks. Walking alone at their usual speed over a distance of 10 meters and performing a cognitive task, such as loud backword counting from fifty (arithmetic task), and performing a motor task of carrying a plate with full glass of water while walking. Under the dual task condition subjects were not given instruction on speed, to avoid biasing either speed of walk or cognitive response. Before testing, standardized verbal instructions regarding the test procedure with visual demonstration of the walking test was given. Since we were not interested in the potential efforts of the cognitive task on changes in gait dynamics and gait instability and were not necessarily concerned with subjects performance on the cognitive task itself, we did not evaluate performance on the cognitive task.

Each subject completed one trial for all of the testing conditions. The walking trials were realized on a 10 meter walkway in a well lit environment at a self selected speed and wearing their own foot wear. The walkway 9 x 0.5 meter was marked on the floor with two sidelines and the subject was told not to step outside these lines while walking. The subject was followed by a spotter in case of falling. Each walking trial was recorded with a sony numeric video camera placed on a tripod in front of the walkway; number of steps, number of lateral stepping over and stops were counted and noted from the recording. Time required to complete the 9 meter course was recorded in seconds using a digital stop watch. Participants were given standard instruction to start walking after hearing "Start" and to keep walking until asked to stop. Both the acceleration and deceleration phase of gait were included for analysis. Average gait speed [velocity] was calculated and expressed in centimeter/seconds, the average cadence in number of steps/minute. The lateral stepping out and stops were counted and expressed in percentage.

Procedure

All tests of subjects were conducted in the physiotherapy O.P.D. of CSS Hospital, at Jai Physiotherapy and Dental Clinic, SF-06, Ansal Galleria, Ansal Town, Meerut, and Physiotherapy O.P.D. of S.B.S. Post Graduate Institute of Bio – Medical Sciences & Research, Balawala, Dehradun. Prior to testing, all the subjects were interviewed about their medical history and had explained the research procedure to them. This information was used to characterize the demographics and health status of subjects participating in the study. Cognition was evaluated by the score of Mini Mental Scale and the balance by the Berg's Balance Scale was completed.

The participants were asked to perform, in randomized order the following tasks. Walking alone at their usual speed over a distance of 10 meters and performing a cognitive task, such as loud backword counting from fifty (arithmetic task), and performing a motor task of carrying a plate with full glass of water while walking. Under the dual task condition subjects were not given instruction on speed, to avoid biasing either speed of walk or cognitive response. Before testing, standardized verbal instructions regarding the test procedure with visual demonstration of the walking test was given. Since we were not interested in the potential efforts of the cognitive task on changes in gait dynamics and gait instability and were not necessarily concerned with subjects performance on the cognitive task itself, we did not evaluate performance on the cognitive task.

Each subject completed one trial for all of the testing conditions. The walking trials were realized on a 10 meter walkway in a well lit environment at a self selected speed and wearing their own foot wear. The walkway 9 x 0.5 meter was marked on the floor with two sidelines and the subject was told not to step outside these lines while walking. The subject was followed by a spotter in case of falling. Each walking trial was recorded with a video camera placed on a tripod in front of the walkway; number of steps, number of lateral stepping over and stops were counted and noted from the recording. Time required to complete the 9 meter course was recorded in seconds using a digital stop watch. Participants were given standard instruction to start walking after hearing "Start" and to keep walking until asked to stop. Both the acceleration and deceleration phase of gait were included for analysis. Average gait speed [velocity] was calculated and expressed in centimeter/seconds, the average cadence in number of steps/minute. The lateral stepping out and stops were counted and expressed in percentage.

Data Analysis

All analysis were obtained using SPSS windows. Demographic data of subjects including sex, age, Berg's Balance Scale and Mini Mental Scale were descriptively summarized. The dependent variables for statistical analysis were gait cadence, gait velocity, lateral stepping out and stops. One way Multivariate analysis of Variance with repeated measures was performed, to analyze the differences in the gait performances among the three conditions: walking with no task, walking with motor task and walking with cognitive task readings. An á level of 0.05 was used to determine statistical significance. Follow up analysis of variance were conducted if the test demonstrated statistical significance.

All possible pair wise post hoc analysis was conducted on the significant dependent variable in order to compare difference between conditions. To prevent an inflation of type one error or to maintain á at p=0.05 for this follow up test; a Bonferroni corrected post hoc test was used.

Table 1: Demographic data

	N	Minimum	Maximum	Mean	SD
Age	50	65.00	75.00	67.90	4.80
BBS	50	41.00	56.00	47.78	3.92
MMS	50	22.00	30.00	27.82	1.99

Table 2: Mean and SD

Variables		Mean	SD
Cadence	**NTCAD**	108.32	20.28
	MTCAD	103.44	18.65
	CTCAD	101.06	22.66
Velocity	**NTVEL**	83.92	30.42
	MTVEL	81.23	28.87
	CTVEL	77.19	29.98
LSO	**NTLSO**	3.33	5.45
	MTLSO	3.68	6.35
	CTLSO	5.47	6.02
Stops	**NTSTP**	0.07	0.50
	MTSTP	0.15	0.76
	CTSTP	1.03	2.81

Table 3: Comparision within variables (post hoc bonferroni test)

Variables	Mean ± SD		P-Value	
NTCAD VS MTCAD	108.32 ±20.28	103.44±18.65	0.004	SIG
NTCAD VS CTCAD	108.32 ±20.28	101.06±22.66	0.039	SIG
MTCAD VS. CTCAD	103.44±18.65	101.06±22.66	0.946	NS
NTVEL VS MTVEL	83.92±30.42	81.23±28.87	0.005	SIG
NTVEL VS CTVEL	83.92±30.42	77.19±29.98	0.166	NS
MTVEL VS. CTVEL	81.23±28.87	77.19±29.98	0.155	SIG
NTLSOVS MTLSO	3.33 ±5.45	3.68±6.35	0.998	NS
NTLSO VS CTLSO	3.33 ±5.45	5.47±6.02	0.034	SIG
MTLSO VS. CTLSO	3.68±6.35	5.47±6.02	0.083	NS
NTSTP VS MTSTP	0.07±0.50	0.15±0.76	0.987	NS
NTSTP VS CTSTP	0.07±0.50	1.03±2.81	0.070	NS
MTSTP VS. CTSTP	0.15±0.76	1.03±2.81	0.110	NS

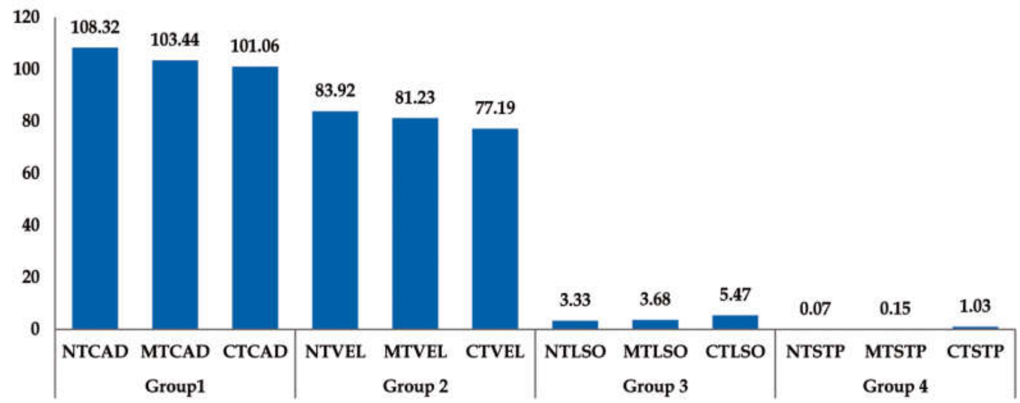

Fig. 1: Mean

Table 4: Anova

	No task	Motor task	Cognitive task	F	P
Cadence	108.3±20.3	103.4±18.6	101.1±22.7	5.317	.006
Velocity	83.9±30.4	81.2 ±30.4	77.2±29.9	6.844	.002
LSO	3.3±5.4	3.7 ± 6.4	5.5±6.02	4.158	.018
Stops	0.07±0.5	0.2 ± 0.8	1.03±2.8	4.824	.010

Significant at $p \leq 0.05$

Results

Base line characteristic of all subjects were summarized in Table 1. The mean score for age was 67.90 ± 4.80. The mean score for Berg's Balance Scale was 47.78 ± 3.92 and for Mini Mental Scale was 27.82 ± 1.99.

Effects of Secondary Task On Gait Performance

Assessment of gait performance in this experiment included four dependent variables: cadence, velocity, lateral stepping out and stops. One way Multivariate Analysis of Variance demonstrated a significant difference in gait performance among the three conditions (walking alone with no task, walking with motor task, walking with a cognitive task). Further analysis was performed to determine which dependent variable was significantly different among the conditions by using a follow up unvariate analysis of variance. Among the three conditions, there was a significant difference for the gait cadence (F=5.317, p=0.006), gait velocity (F=6.844, p=0.002), lateral stepping out (F=4.158,p=0.018) and stops (F=4.824,p=0.010). All possible pair wise post hoc comparisons were performed on gait velocity, gait cadence, lateral stepping out and stops, to compare conditions. Results are presented in the following sections (Table 4).

Effects of Secondary Task on Gait Velocity

Table 2, 3 and 4 illustrate that the geriatric subjects demonstrated a reduction in walking speed for the cognitive performance. Post hoc comparisons showed that significant difference for gait velocity between no task and cognitive task condition (p=0.005) and no significant difference in walking speed was found between the no task and motor task and also between cognitive task and motor task situations.

Effect of Secondary Task in Gait Cadence

Table 3, 4 and Figure 1 shows that the cadence values for each of walking conditions. The decline in mean cadence was seen with motor and cognitive task. In addition the post hoc comparison, there was significant difference between the no task and motor task situation (p=0.004) and also between the no task and cognitive task conditions (p=0.039), but no significant difference was seen between the motor and cognitive task condition. The mean cadence decreased with cognitive task compared to walking alone with no task and with motor task.

Effects of Secondary Task on Lateral stepping Out

Table 3, 4 and Figure 1 showed that the lateral stepping out values for each of the walking conditions. The mean lateral stepping out during cognitive task was more. The post hoc comparison showed significant difference among the no task and cognitive task condition (p=0.034), but no significant difference between the no task and motor task and also among the motor task and cognitive task conditions.

Effects of Secondary Rask on Stops in Gait

Table 3, 4 and Figure. 1 showed that the values for stops in gait in each of the walking condition. In contrast to the other dependable variable the secondary tasks did not have a significant effect on stops during gait.

Discussion

This study of 50 geriatric subjects, showed statistically significant changes in cadence, velocity, lateral stepping out and stops with simultaneous performance of secondary cognitive and motor task. The results showed that geriatric subjects experienced marked deterioration in their gait pattern when they are required to perform either a motor or cognitive secondary task at the same time as walking. The geriatric population had slower gait and reduction in speed when they engaged in dual task conditions. They reduced their cadence rate when required to perform another task while walking. The results show that the dual cognitive strategy had a greater effect on gait in geriatric population than did the dual motor strategy, suggesting that a cognitive task may be more difficult than a dual motor task.

Contrary to the prediction, the secondary motor task did not produce a statistically significant reduction in gait speed or an increase in the lateral stepping out and stops in the geriatric subjects, probably because the secondary task were relatively easy, highly familiar, well learned and performed routinely many times every week by geriatric population. The stepping rate of the elderly while performing secondary motor task was significantly decreased compared to base line. O'Shea.et.al. found that both cognitive and motor concurrent task reduced the performance of gait in Parkinson's disease subjects, however the type of secondary task was not a major determinant of the severity of dual task interference [2]. The natural walking velocity of the geriatric subjects was significantly reduced; this reduction was not due to a decrease in cadence, but rather to a reduction in stride length [12].

The stops during gait did not statistically differ in three of the different conditions; however frequency of stops was more in cognitive secondary task as compared to the baseline, clinically. The cognitive secondary task produced a statistically significant reduction in gait speed, the stepping rate, cadence or an increase in lateral stepping out, but did not produce a statistically significant increase in stops. The motor and cognitive secondary task did not show any statistical significant difference.

Conclusion

The results of the study show that elderly subjects attend to do a complex secondary task at the same time as walking, there is a significant dual task interference that compromises the cadence, speed of walking, lateral stepping out and stops. Cognitively demanding activity during walking appears to increase the gait interference more and therefore the type of secondary task was a major determinant of the severity of dual task interference. Performance changes in gait and secondary task when performed simultaneously, confirms that walking is an attention demanding task in elderly population.

The results of my study supports the hypothesis, within the limitation of this study. The result of this study provides a base for further research as they presents valuable outcomes for practitioners treating the geriatric population for cognitively demanding activity during gait training.

Refrences

1. Nancy Harada, Vicki Chiu, Eileen Fowler, Martin Lee, David B Reuben. physical therapy to improve functioning of older people in residential care facilities. physical therapy. 1995; 75(9): 830-839.
2. Simone O'Shea, Meg E Morris, Robert Lansek. Dual task interference during gait in people with Parkinson disease: effects of motor versus cognitive secondary tasks. Physical Therapy. 2002; 82(9): 888-897.
3. Oliver Beauchet, Vernique Dubost, Kamiar Aminian, Regis Gonthier, Reto W.Kressig. dual task related gait changes in the elderly: does the type of cognitive task matter. Journal of motor behavior. 2005; 37(4): 259-264.
4. John H.Hallman, Kathleen.B.Salaman, and Andrew W.Preist. Age related differences in stride to stride variability during dual task walking: a pilot study. Journal of geriatric physical therapy: 2004; 27(3): 83-86.
5. David L Wright, Tammy L Kemp. The dual task methodology and assessing the attentional demands of ambulation with walking devices. Physical Therapy. 1992; 72(4): 306-313.
6. Ginette Azizah Mbourou, Yves Lajoie Normand Tesdale. Step length variability at gait initation in elderly fallers and non fallers and young adults. Gerontology. 2003; 49: 21-26.
7. Oliver Beauchet, Veronica Dubost, Francois R Herrmann and Reto W Kressig. Stride to stride variability while backward counting among healthy young adults. Journal of neuroengineering and

rehabilitation. 2005; 2: 1-8.

8. Andrew A Guccione. Geriatric physical therapy: 1992; 2nd edition: 1-7, 412-423, 542-556.
9. Michael W Whittle. Gait analysis an introduction-normal gait, gait in the elderly. 1995; 2nd edition: 105-107.
10. Jacquline M Bond, Meg Morris. Goal directed secondary motor tasks: their effects on gait in subjects with Parkinson's disease. Arch phys med rehab. 2000; 81: 111-116.
11. Marja Jylha, Jack M Guralink, Jennifer Balfour and Linda P Fried. Walking difficulty, walking speed and age as predictors of self rated health, the women's health and aging study. Journal of gerontology, medical sciences. 2001; 56A: M609-M617.
12. David A Winter, Aftab E Patla, James S Frank, Sharon E Walt. Biomechanical walking pattern changes in the fit and healthy elderly. Physical Therapy. 1990; 70(6): 340-346.